

**MANAGEMENT OF NEWLY DIAGNOSED TYPE 2 DIABETES BY  
*TRIGONELLA FOENUM-GRÆCUM***

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**ABSTRACT**

The objective of our study was to determine the role of fenugreek seed powder in the management of newly diagnosed type 2 diabetes. We selected 38 patients with newly diagnosed type 2 diabetes, aged between 30-45 years, without any significant diabetes complications and were grouped as: Group I (n=19) consumed 25 g. fenugreek twice daily (before breakfast and dinner) and on moderate exercise for two months, Group II (n=19) subjects were on dietary control. Blood sample collected before and after the treatment were analyzed for lipid profile and fasting blood sugar (FBS). Atherogenic index of plasma (AIP) was computed for each patient at baseline. The subjects received fenugreek seed powder and on exercise showed significant reduction in the FBS, cholesterol, triglyceride and LDL cholesterol which were statistically significant. There was a significant increase in the HDL cholesterol. The AIP value was statistically significant with subjects who received fenugreek seed powder and on exercise. FBS and triglyceride were reduced with the subjects who were on diet control. Our data showed that the management of type 2 diabetes would be easier with therapeutic approach of fenugreek seeds.

**KEYWORDS:** Type 2 diabetes, fenugreek, AIP, anti-hyperglycemic effect

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**INTRODUCTION**

Type 2 diabetes is one of the most prevalent and fastest growing diseases in India. Diabetes not only affects prosperous nations, but often reaches its highest frequency in poor and disadvantaged communities that can least afford the heavy burden of treatment and long-term complications. Though adequate therapeutic services and modalities are widely available, complementary and alternative medicines (CAM) therapies are used often with or without consulting their physicians. In spite of the presence of known antidiabetic medicine in the pharmaceutical market, remedies from medicinal plants are used with success to treat this disease<sup>1</sup>. It has been attributed that the antihyperglycemic effect of these plants is due to their ability to restore the function of pancreatic tissues by causing an increase in insulin output or inhibit the intestinal absorption of glucose or to the facilitation of metabolites in insulin dependent processes. Hence

treatment with herbal drugs has an effect on protecting  $\beta$ -cells and smoothing out fluctuation in glucose level<sup>2</sup>. One such CAM therapies commonly used in Dakshina Kannada district is Fenugreek seeds (*Trigonella foenum-græcum*). It is one of the oldest medicinal plants, dating back to Hippocrates and ancient Egyptian times<sup>3</sup>. Fenugreek contains saponins, glycosides and other chemical constituents<sup>4</sup> which has beneficial effects in pancreatic and other tissues and improves glucose absorption, hyperlipidemic state as well as decrease insulin resistance<sup>5-7</sup>. Insulin resistance is often associated with increased triglyceride (TG) and decreased HDL-cholesterol (HDL-C) concentrations and increased small LDL particles. The Atherogenic Index of Plasma (AIP), defined as  $\log(\text{TG}/\text{HDL-C})$ , has recently been proposed as a marker of plasma atherogenicity because it is increased in people at higher risk for coronary heart disease and is inversely correlated with LDL particle size. Thus this study was designed to compare the

efficacy of fenugreek versus diet control in the treatment of newly diagnosed type 2 diabetes.

### MATERIAL AND METHODS

The study participants were newly diagnosed type 2 diabetes patients who were aged between 30-45 years, without any significant diabetes complications. Thirty eight subjects were thus selected for the study. Written consent of the patients was obtained before the study.

Patients were divided into 2 groups:

I- Subjects consumed only fenugreek powder with moderate exercise.

II- Subjects on dietary control.

Fenugreek of good quality were used and was consumed twice daily in powdered form (before breakfast and dinner), of about 25g dose each time with water for two months. Measurements of lipid profile and FBS were done as per the standard methods. AIP was computed for each patient at baseline and at each subsequent visit according to the following equation:

$$\text{AIP} = \log (\text{TG}/\text{HDL-C})$$

Statistical analysis was carried out using Student's paired and unpaired 't' tests. Paired 't' test was used to determine the significance within the groups and unpaired 't' test was used to determine the significance between the groups.

### RESULTS

The results of the study are depicted in the tables. The effects of fenugreek on FBS, lipid profile along with AIP are presented in **table 1**. The group which consumed fenugreek seed powder with moderate exercise showed statistically significant lower mean value ( $p < 0.001$ ).

**Table 2** presents the effects of diet control alone on FBS, lipid profile along with AIP. Only FBS, TG and VLDL showed statistically significant lower mean value.

Comparison value between fenugreek and diet control group after 2 months is presented in **table 3**, which shows significantly lower mean values in lipid profile.

### DISCUSSION

This study demonstrates that approximately 8 weeks of treatment with fenugreek seeds along with exercise improves insulinotropic activity significantly which is supported by previous study by Sauvaire y et al.<sup>7</sup>. This progressive improvement is reflected on the glycemic state, lipid profile and is similar with the result of Basch et al.<sup>8</sup>.

In the current study, use of fenugreek seeds have shown to decrease FBS levels and this hypoglycemic effect of fenugreek seed is supported by studies in animals<sup>9-12</sup> and in humans<sup>13-16</sup>. The mechanism by which fenugreek seeds induce a hypoglycemic effect may be due to an amino acid: 4-hydroxy isoleucine found in it. This amino

acid has shown to have both insulinotropic and antidiabetic properties<sup>17, 18</sup>. In fenugreek seeds the concentration is around 0.56% w/w. It was investigated by the same author that 4-hydroxyisoleucine directly caused pancreatic  $\beta$  cell stimulation, thus the explanation. The hypoglycemic mechanisms of fenugreek seed include delay of gastric emptying, slowing carbohydrate absorption and inhibition of glucose transport from the fiber content, as well as increased erythrocyte insulin receptors and modulation of peripheral glucose utilization<sup>19-22</sup>.

Our result shows that fenugreek seed has an influence on lipid metabolism and it showed a significant level of decrease in TG and increase in HDL which is supported by Gupta et al.<sup>16</sup>.

Our study further supported a progressive decline in cholesterol level and a significant reduction in LDL fraction which implies the action of saponins<sup>15-24</sup> suggesting that the gum fraction or dietary fiber fraction (galactomannans) present in it. It was hypothesized that micelles formed from bile acids and saponins are not available for absorption due to their large size. A further insight in the lowering effect of cholesterol was given by Evans et al.<sup>24</sup>.

The galactomannan isolated from fenugreek exhibited a prominent selective inhibitory effect against intestinal lipase activity. It was found to significantly delay the absorption of LDL-cholesterol and triglycerides and helps to increase HDL-cholesterol. In addition, fenugreek galactomannan efficiently protects the hepatic function observed by the considerable decrease of aspartate and alanine transaminases (AST and ALT) and lactate dehydrogenase (LDH) contents in the serum of diabetic rats. The beneficial effects of fenugreek galactomannan were also evidenced by their capacity to inhibit diabetes-induced kidney injury through lowering the urea and creatinine content in plasma<sup>24</sup>.

Several other beneficial properties of fenugreek have been reported; as an antioxidant<sup>25,26</sup>, as an anticarcinogenic<sup>27</sup>, as an anti-microbial<sup>28, 29</sup>, as an anti-ulcer<sup>30</sup>, as an anti-obesity<sup>31</sup> and hypocholesterolemic<sup>32-34</sup>. The most looked for actions of the extracts of fenugreek include protection against hyperglycemia in patients with diabetes<sup>35-37</sup>.

AIP is an important tool for analyzing the results of clinical studies. AIP provides information about the atherogenicity of plasma and quantifies the response to therapeutic intervention.

The association of TGs and HDL-C in this simple ratio theoretically reflects the balance between risk and protective lipoprotein forces. Patients in this study

population had high AIP values at baseline. Fenugreek treatment significantly decreased AIP from baseline in each of the study groups. Fenugreek treatment groups had a significantly lower AIP compared with their respective diet control group.

Therefore, these investigations about fenugreek seeds reveal it as a potent natural food source that has a capacity to prevent and improve the disease and also act as therapeutic agent. Hence these data indicate that the management of type 2 diabetes would be easier with therapeutic approach of fenugreek seeds.

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**Table 1: Laboratory parametric values of subjects receiving fenugreek seed powder with exercise**

| Parameters | Initial      | After 2 months | P Value  |
|------------|--------------|----------------|----------|
| FBS        | 226.95±32.81 | 206.79±63.33   | .0001*** |
| CHOLESTROL | 208.32±25.29 | 198.53±23.50   | .0001*** |
| TG         | 258.63±38.10 | 239.32±36.21   | .0001*** |
| HDL        | 39.91±5.09   | 44.91±5.10     | -        |
| LDL        | 116.74±23.61 | 105.74±22.36   | .0001*** |
| VLDL       | 51.68±7.68   | 47.89±7.24     | .0001*** |
| AIP        | 0.81±0.08    | 0.72±0.07      | .0001*** |

\*\*\*Highly significant

**Table 2: Laboratory parametric values of subjects with diet control**

| Parameters | Initial      | After 2 months | P Value             |
|------------|--------------|----------------|---------------------|
| FBS        | 209.42±63.01 | 200.32±63.33   | .0361*              |
| CHOLESTROL | 218.32±32.23 | 218.21±32.80   | .9689 <sup>NS</sup> |
| TG         | 218.32±32.71 | 209.37±35.29   | .002**              |
| HDL        | 37.58±3.72   | 36.89±3.74     | .5539 <sup>NS</sup> |
| LDL        | 137.05±32.88 | 139.37±34.90   | .4632 <sup>NS</sup> |
| VLDL       | 43.68±6.56   | 41.95±7.14     | .0038**             |
| AIP        | 0.76±0.09    | 0.75±0.08      | .38 <sup>NS</sup>   |

\*Significant, \*\* Moderately significant, NS: Not significant

**Table 3: Comparison between the lab parametric values of subjects receiving fenugreek and on diet control after 2 months**

| Parameters | Fenugreek consumed group | Diet control group         |
|------------|--------------------------|----------------------------|
| FBS        | 206.79±63.33             | 200.32±63.33 <sup>NS</sup> |
| CHOLESTROL | 198.53±23.50             | 218.21±32.80*              |
| TG         | 239.32±36.21             | 209.37±35.29*              |
| HDL        | 44.91±5.10               | 36.89±3.74***              |
| LDL        | 105.74±22.36             | 139.37±34.90**             |
| VLDL       | 47.89±7.24               | 41.95±7.14*                |
| AIP        | 0.72±0.07                | 0.75±0.08 <sup>NS</sup>    |

\*\*\*Highly significant, \*\*Moderately significant, \*Significant, NS: Not significant

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